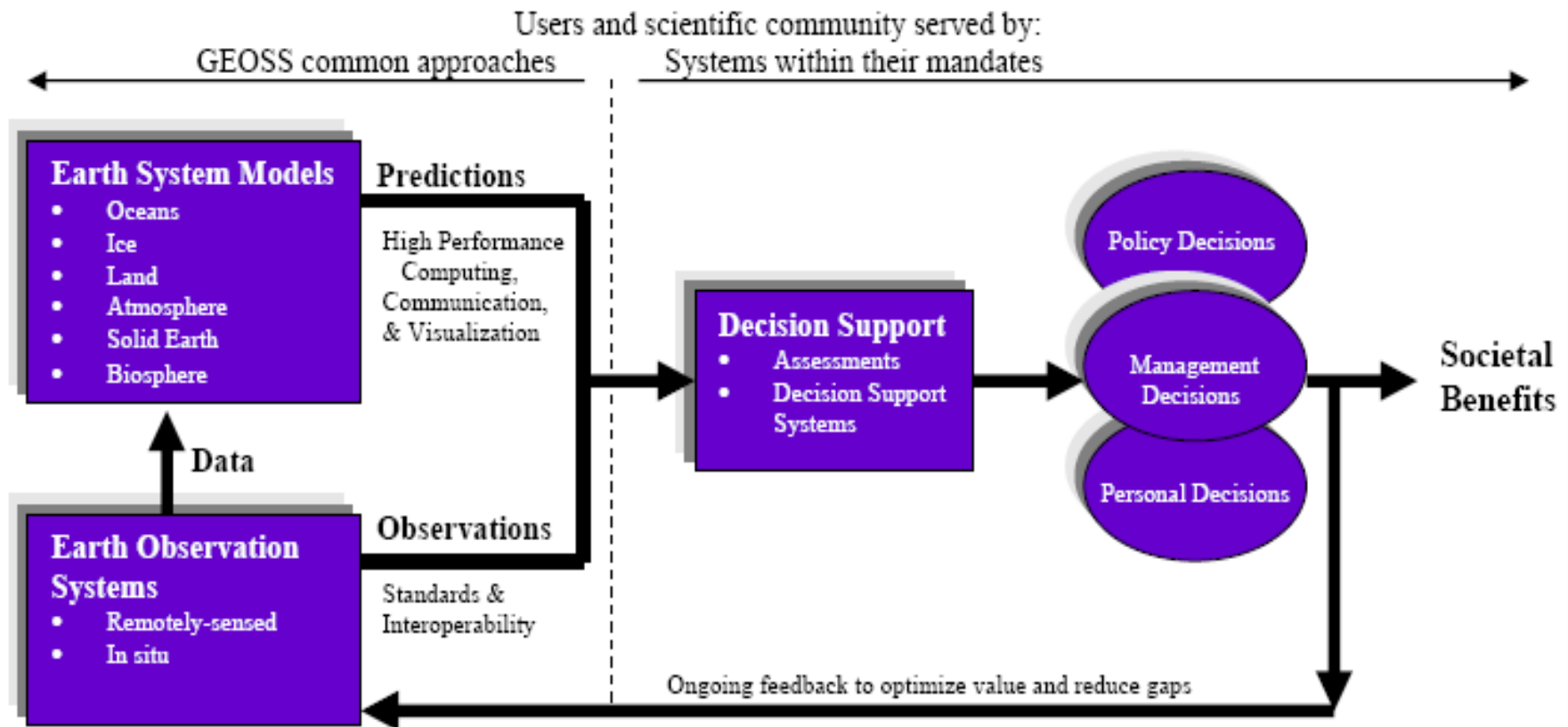


U.S. Environmental Protection Agency – Region 9's California Sustainability Indicators Suite

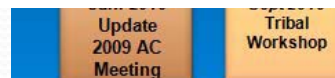
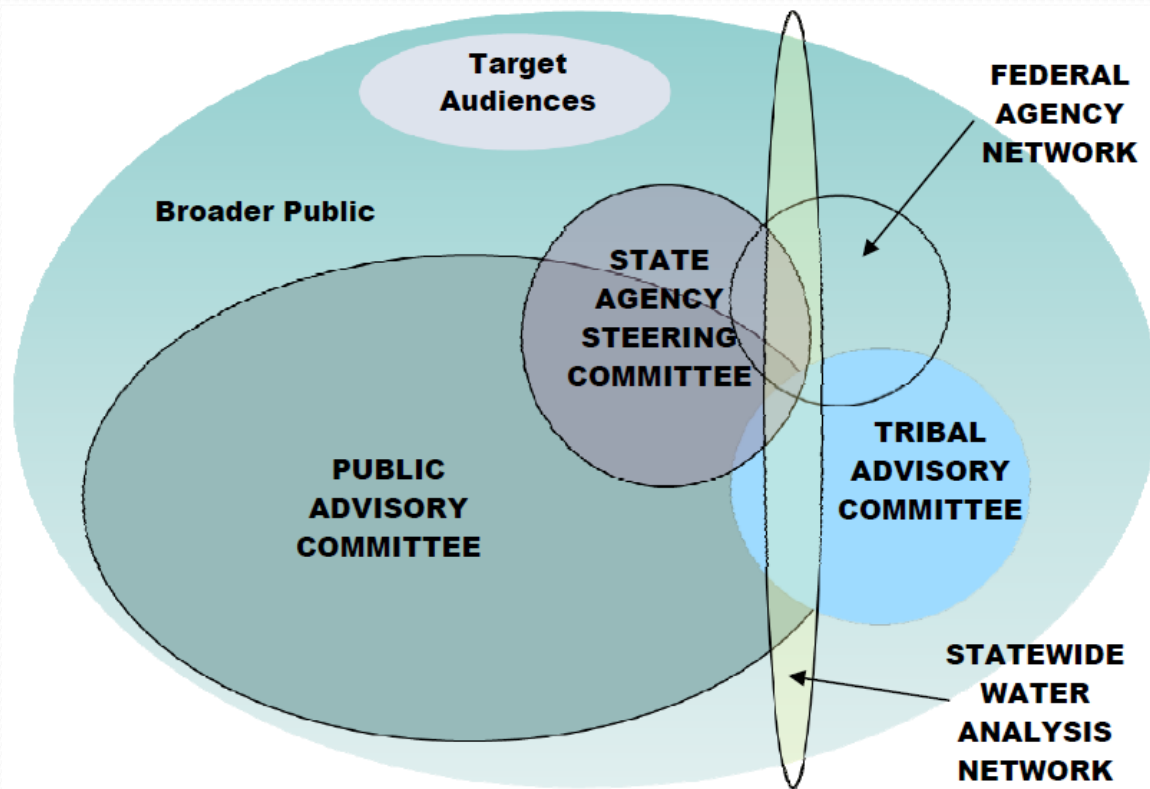


Vance Fong – Don Hodge – Sarah Rizk
U.S. Environmental Protection Agency
The Pacific Southwest Region

Linking Earth Observations to Societal Benefits: Global Earth Observation System of Systems



California Water Plan 2013 Update



Deliverables



Conceptual Design: California Sustainability Indicators Suite

Ecological Footprint

compares the use of natural resources to biological capacity to supply them.

Plant Growth Index (PGI)

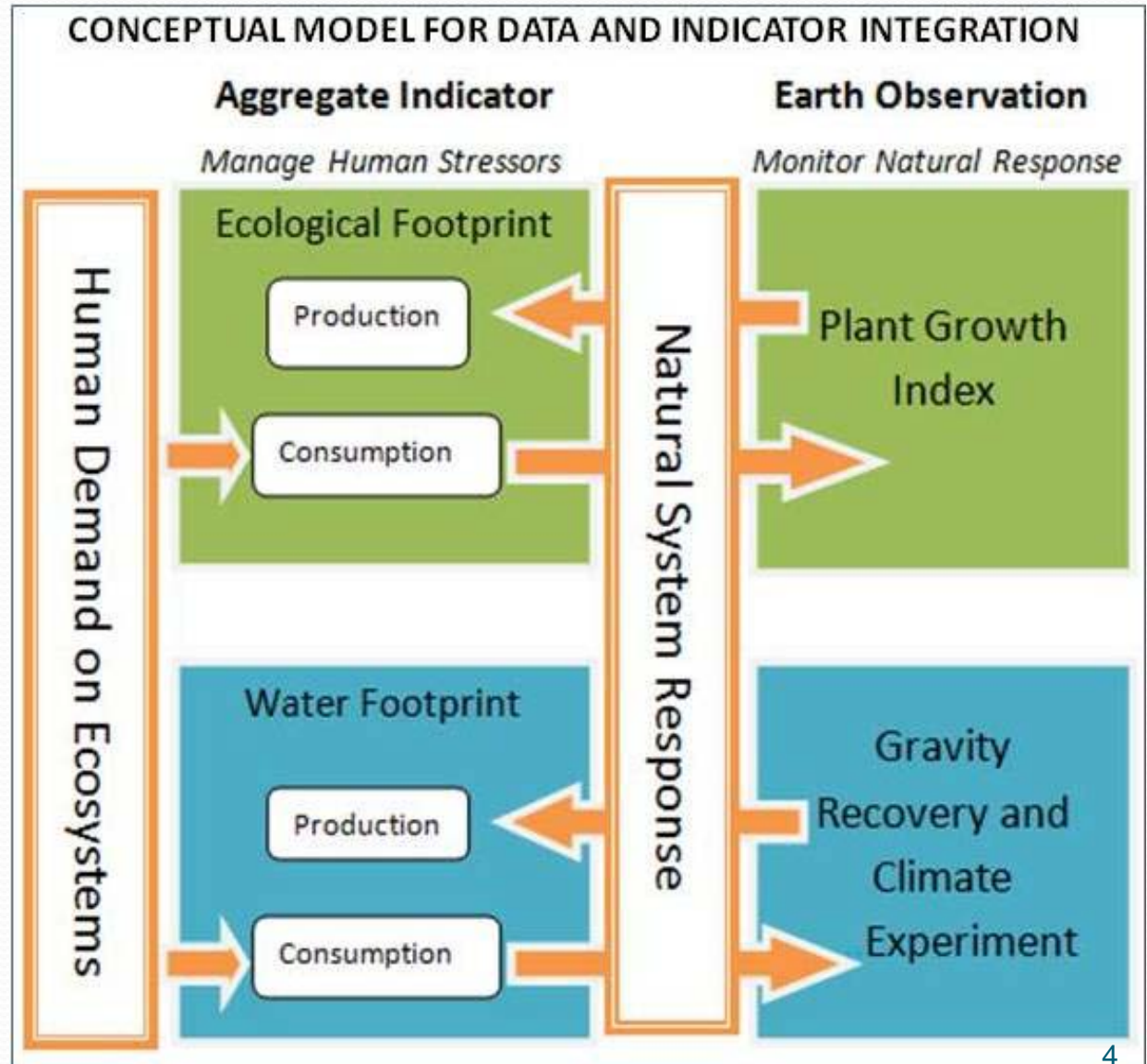
measures changes in photosynthesis in plant communities.

Water Footprint

accounts comprehensively for sources and uses of water in a specified area.

Gravity Recovery and Climate Experiment

measures changes in total water in a specified area.



Decision Support Tool



Ecological Footprint

Data gathering
Input into model

*Use Footprint
to inform policy*

Indicators



Plant Growth Index

Processed Data
from NASA/NOAA

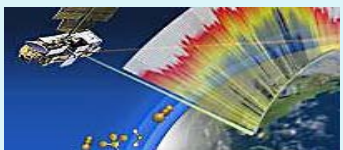
*Using models
to connect with
Eco & H₂O
footprints*



Water Footprint

Data gathering
Input into model

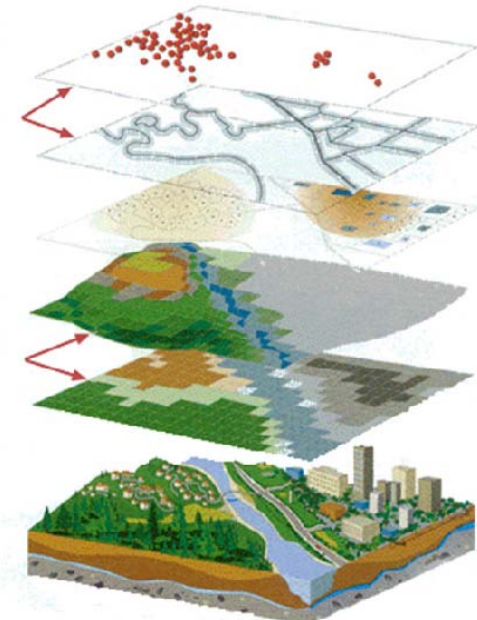
*Use Footprint
to inform
Policy*



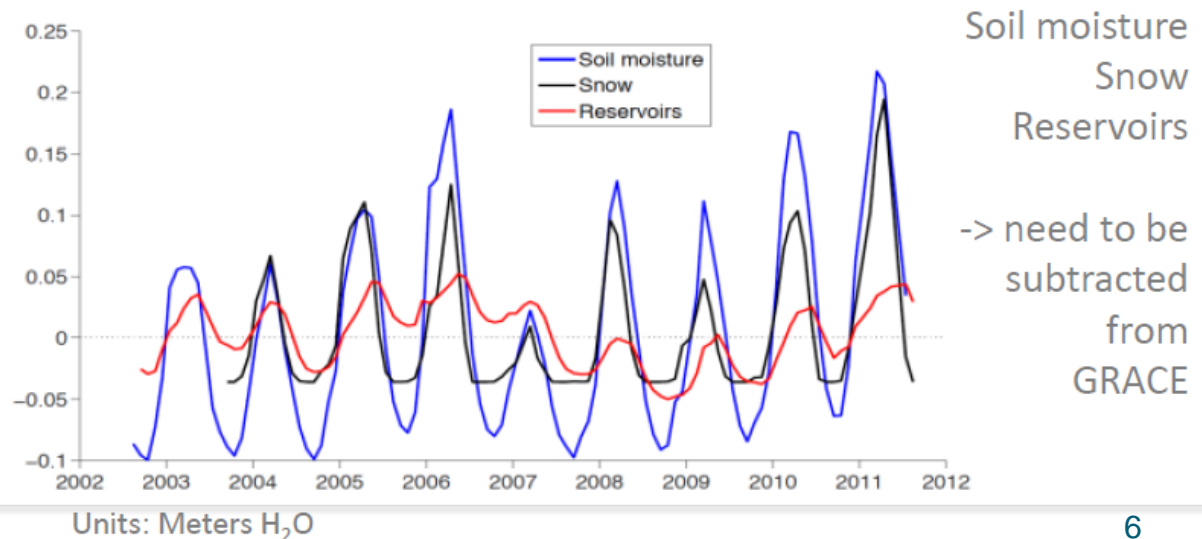
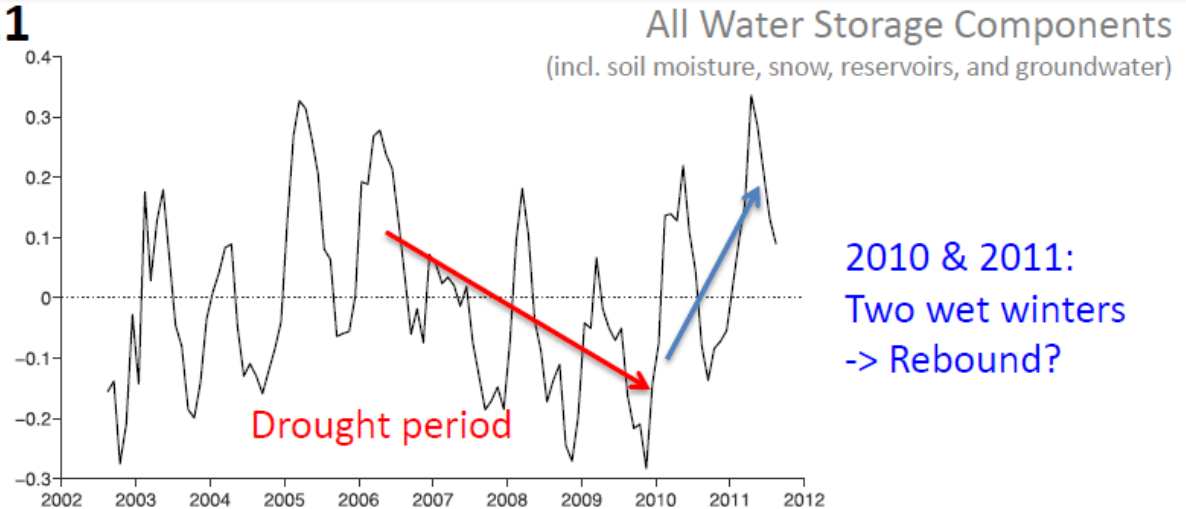
GRACE

Processed Data
from NASA

*Using models
to connect with
Eco & H₂O
footprints*



California's Central Valley: Terrestrial Water Storage changes measured from GRACE 2003 - 2011



GRACE spatial view

Total water storage, California

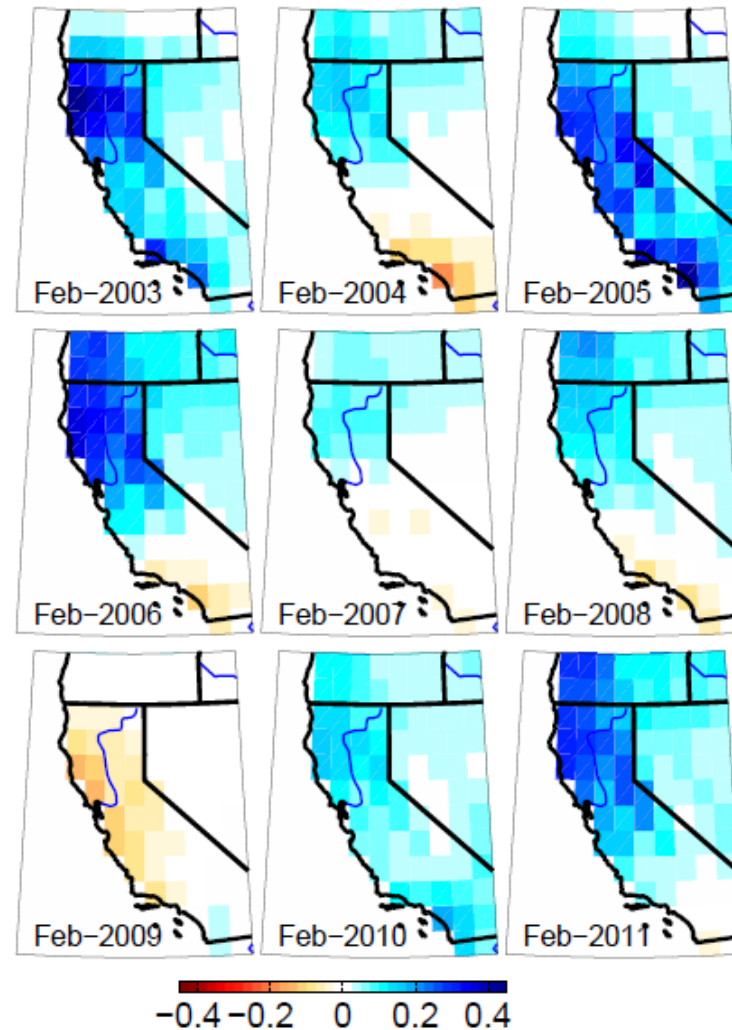


Figure 8: Total water storage anomalies for the month of February for the years shown. Units: $m-H_2O$.

COMPARISON OF GRACE AND C2VSIM

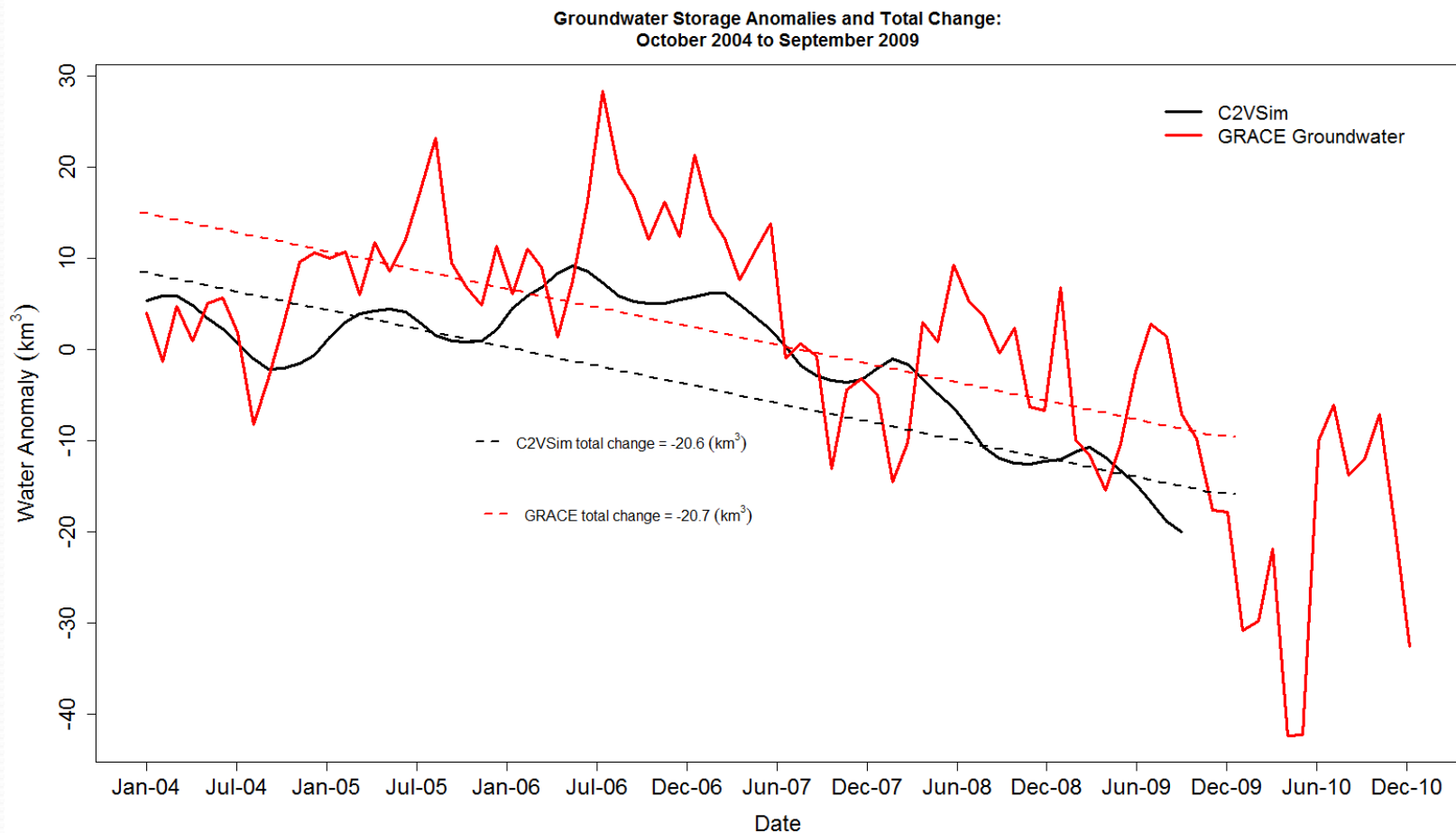
Q3

Previous Work

Total change over the time period October 2004 to September 2009

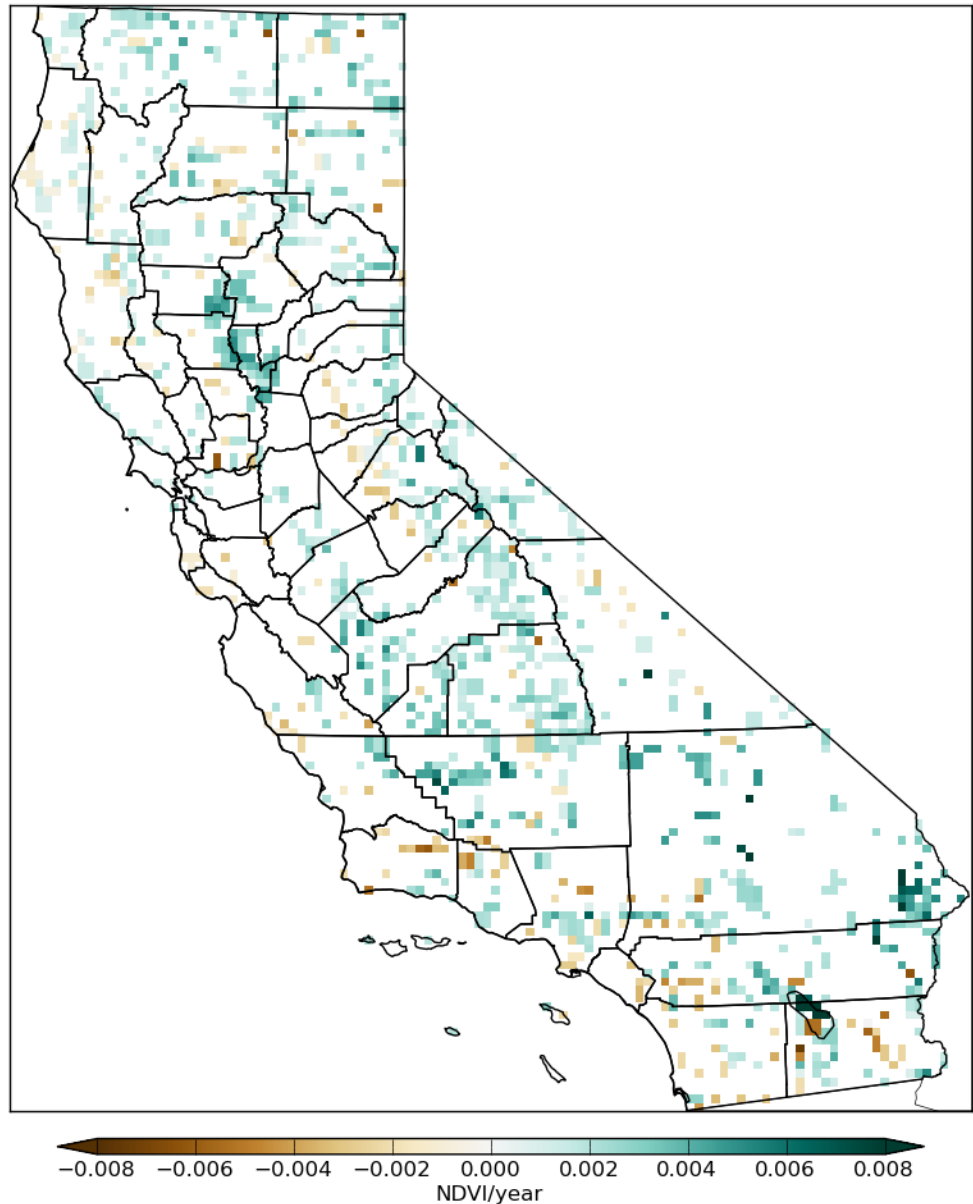
C2VSim total change = $-20.6 \pm 3.01 \text{ km}^3$

GRACE downscaled change = $-20.7 \pm 7.57 \text{ km}^3$

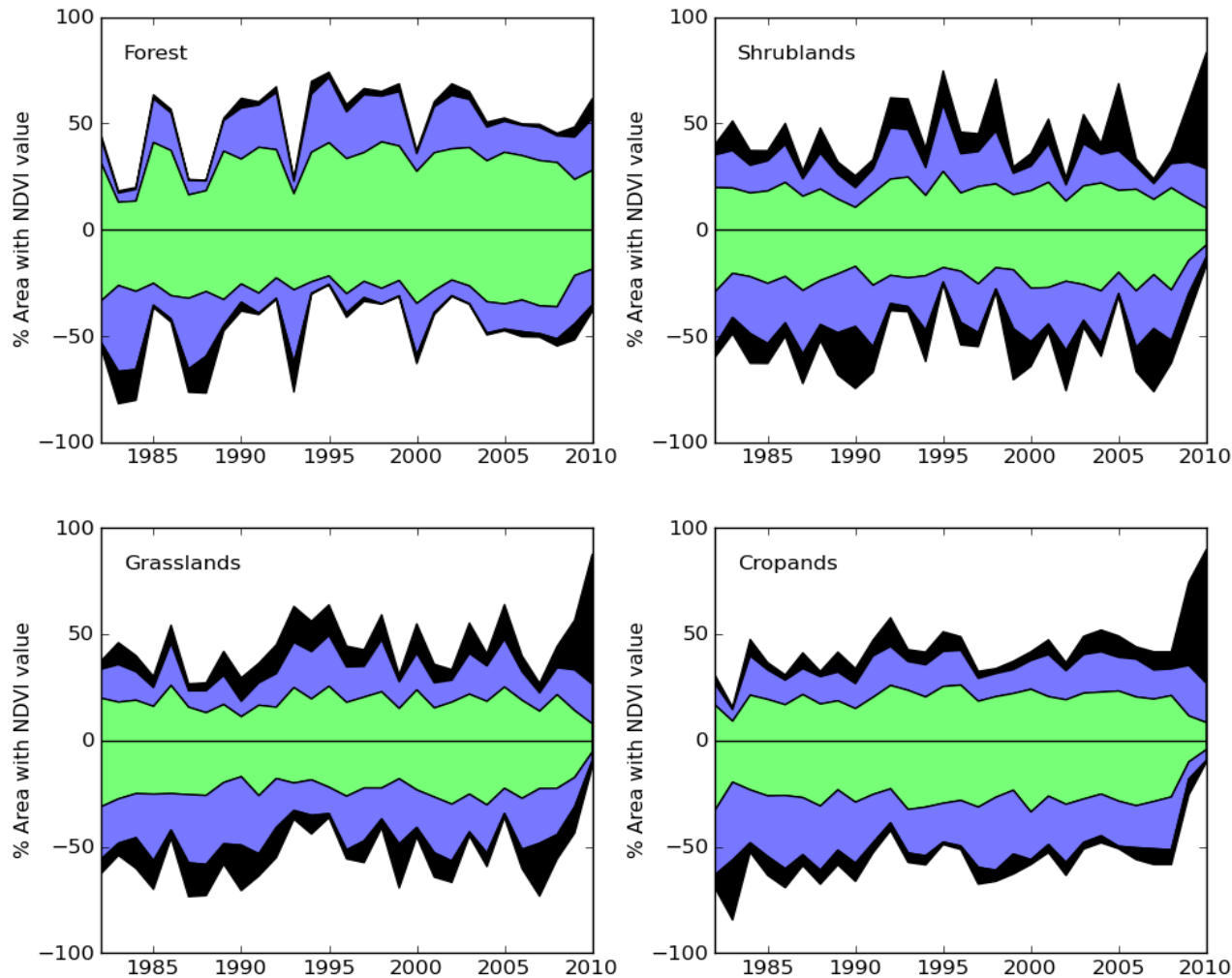


Plant Growth Index

Statistically significant trends in
Plant Growth Index from 1982 to
2010, calculated from 8 km data



Plant Growth Index: changes in NDVI over time



Ecosystem Area with Increasing or Decreasing Plant Growth Index
Relative to Average for 1982-2010 0 to 0.02 0.02 to 0.05 >0.5

Ecological Footprint

Biocapacity:

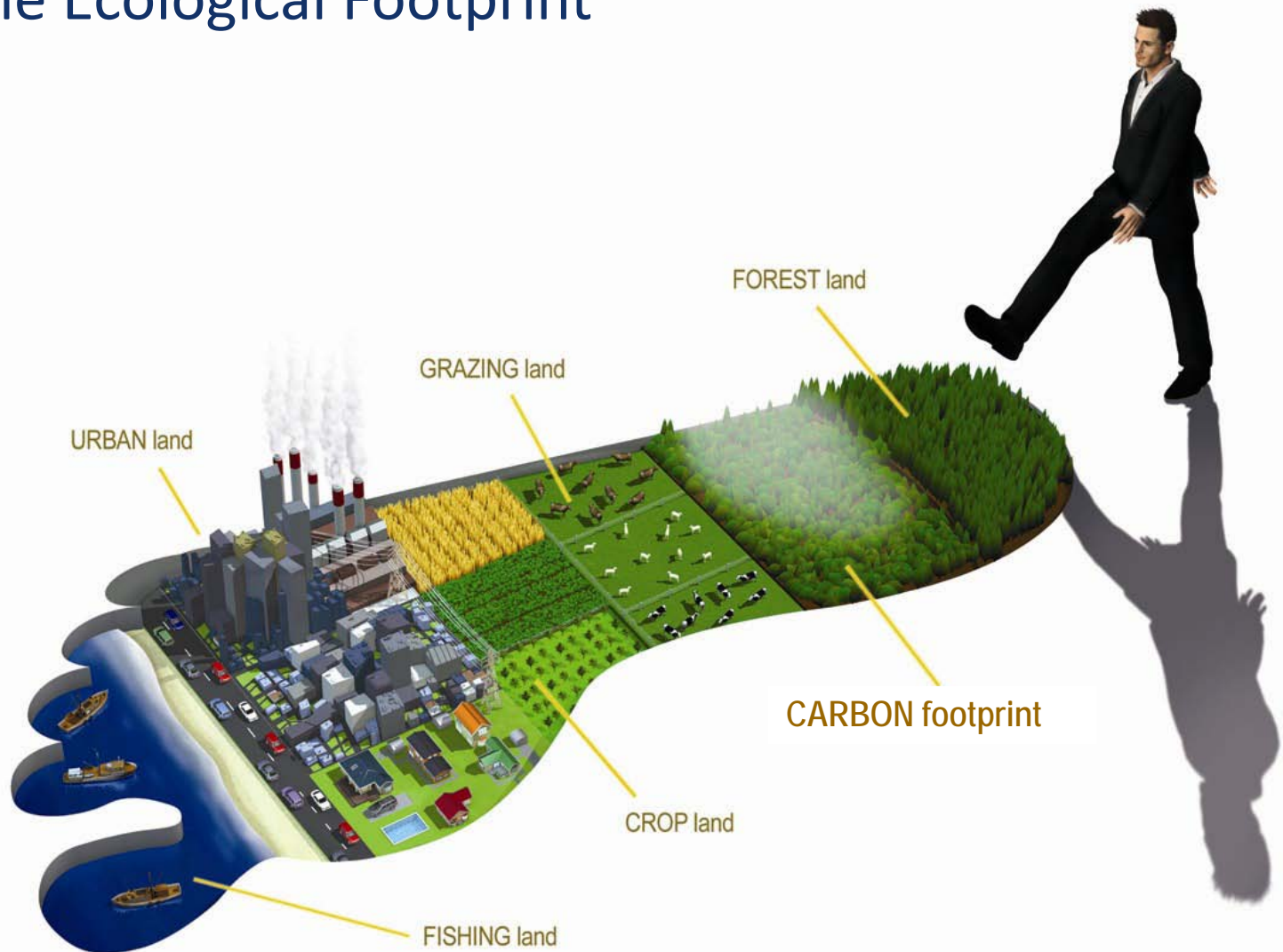
How much bioproductive area is **available to us**?



Ecological Footprint:

How much bioproductive area **do we demand**?

The Ecological Footprint



Ecological Footprint analysis

National Footprint Accounts 2011 Edition - Data Year 2008

California

Ecological Footprint and Biocapacity Totals

Demand Type	EF _{Production} [gha]	EF _{Imports} [gha]	EF _{Exports} [gha]	EF _{Consumption} [gha]	Biocapacity [gha]
Carbon Footprint	89,549,955	103,474,631	35,765,348	157,259,238	-
Cropland	12,359,580	21,794,378	5,484,998	28,668,961	12,359,580
Grazing Land	2,836,741	565,941	815,902	2,586,780	2,836,741
Fishing Grounds	744,853	3,040,178	794,485	2,990,545	8,246,214
Forest Land	2,242,887	20,268,991	695,295	21,816,583	9,933,040
Built-up Land	1,820,316	-	-	1,820,316	1,820,316
TOTAL	109,554,332	149,144,119	43,556,028	215,142,423	35,195,890

Ecological Footprint and Biocapacity Per Capita

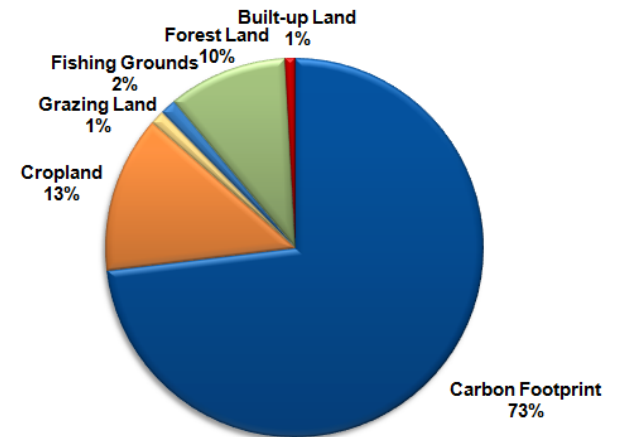
Demand Type	EF _{Production} [gha person ⁻¹]	EF _{Imports} [gha person ⁻¹]	EF _{Exports} [gha person ⁻¹]	EF _{Consumption} [gha person ⁻¹]	Biocapacity [gha person ⁻¹]
Carbon Footprint	2.44	2.82	0.97	4.28	-
Cropland	0.34	0.59	0.15	0.78	0.34
Grazing Land	0.08	0.02	0.02	0.07	0.08
Fishing Grounds	0.02	0.08	0.02	0.08	0.22
Forest Land	0.06	0.55	0.02	0.59	0.27
Built-up Land	0.05	-	-	0.05	0.05
TOTAL	2.98	11.10	8.00	6.81	0.96

		Total		Per Capita	
		California	World	California	World
Available Biocapacity	[gha]	35,195,890	12,319,187,178	0.96	1.83
Footprint of Production	[gha]	109,554,332	16,251,258,986	2.98	2.41
Net Imports	[gha]	105,588,091		3.10	
Footprint of Consumption	[gha]	215,142,423		6.81	
(BC - EF _P)	[gha]	-74,358,441	-3,932,071,809	-2.02	-0.58
(BC - EF _C)	[gha]	-179,946,533		-5.85	

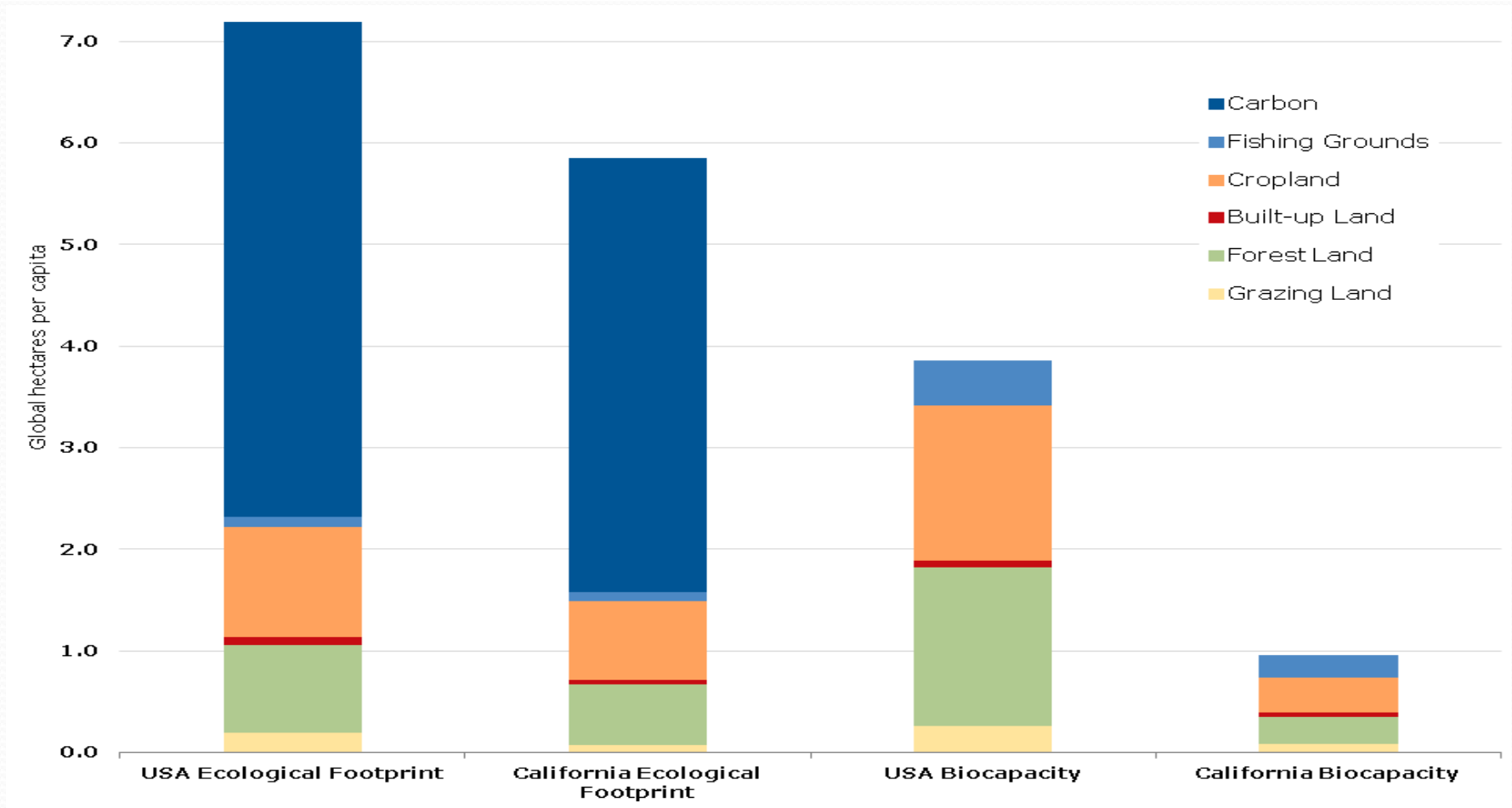
Number of planets demanded if world's population lived like residents of California

3.73

Ecological Footprint of Consumption by Land Use Type



California Ecological Footprint Analysis: Preliminary Results



Ecological Footprint and biocapacity of the United States compared to California, 2008.

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